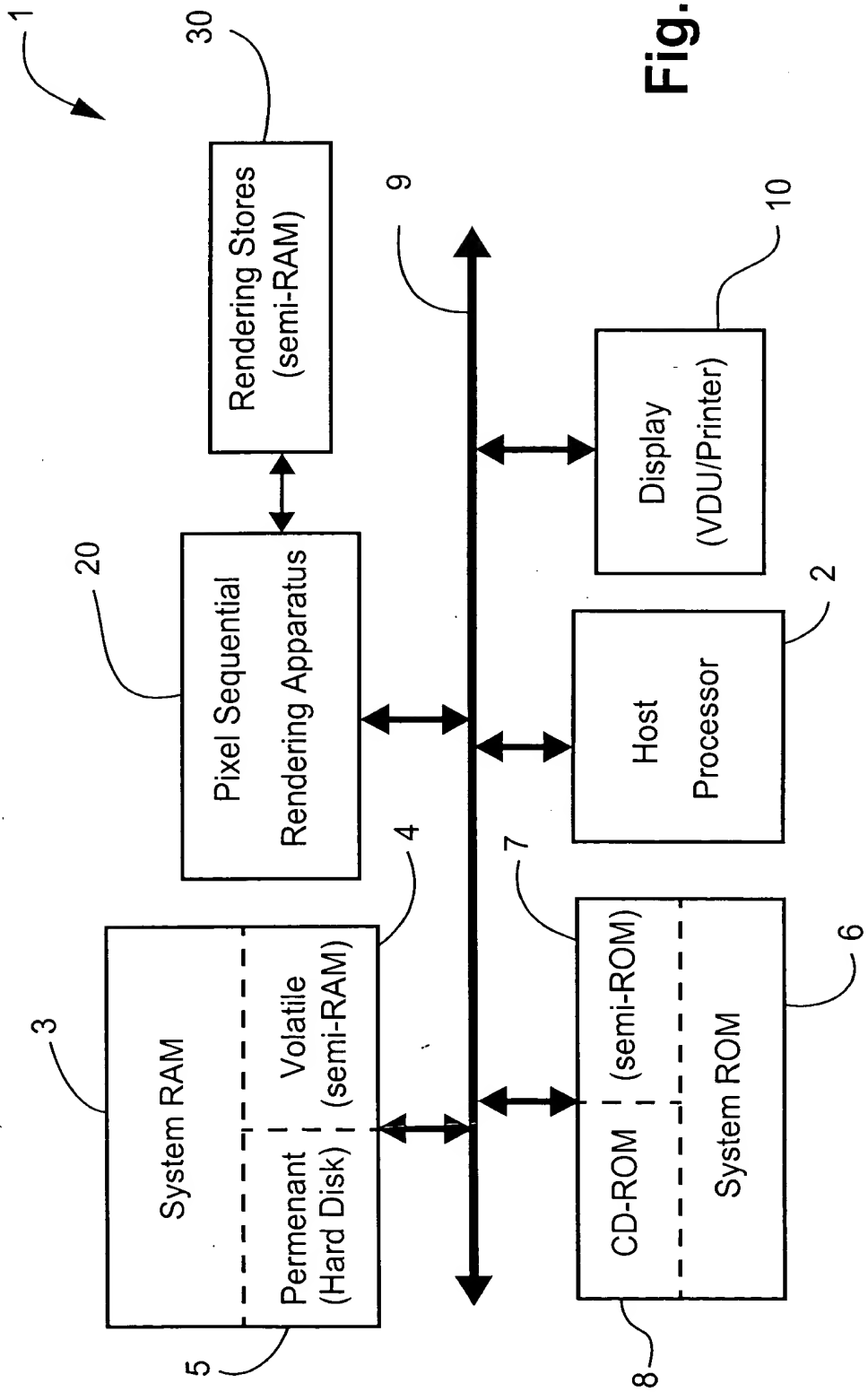

1
30
Rendering Stores
(semi-RAM)
9
10
Display
(VDU/Printer)
20
Pixel Sequential
Rendering Apparatus
2
Host
Processor
4
7
3
System RAM
Permenant
(Hard Disk)
Volatile
(semi-RAM)
CD-ROM
(semi-ROM)
System ROM
6
5
8

Fig. 1

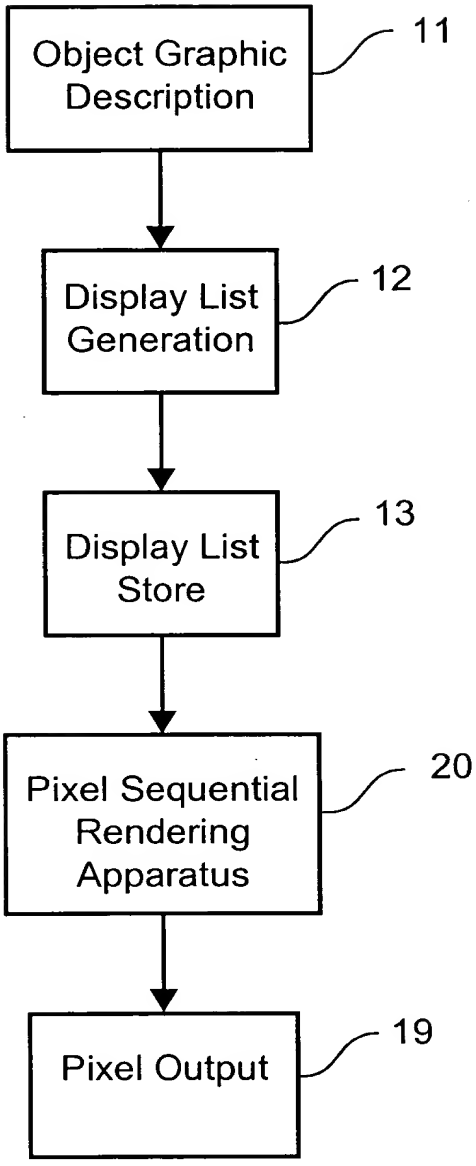

Object Graphic Description
11
Display List Generation
12
Display List Store
13
Pixel Sequential Rendering Apparatus
20
Pixel Output
19

Fig. 2

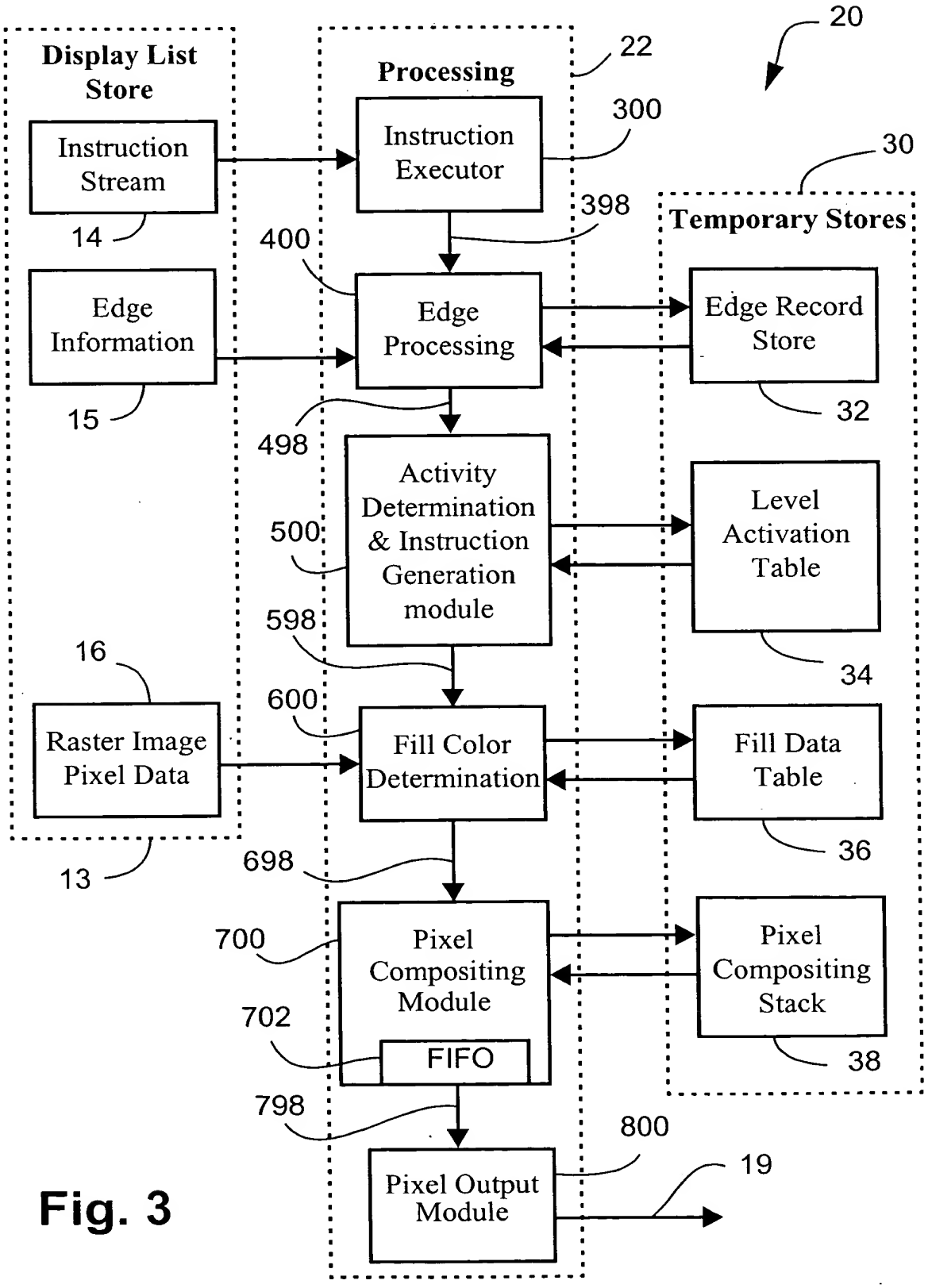

20
Display List Store
Processing
22
Instruction Stream
14
Instruction Executor
300
30
Temporary Stores
398
400
Edge Information
15
Edge Processing
Edge Record Store
32
498
Activity Determination & Instruction Generation module
500
Level Activation Table
34
598
16
Raster Image Pixel Data
13
600
Fill Color Determination
Fill Data Table
36
698
700
Pixel Compositing Module
Pixel Compositing Stack
38
702
FIFO
798
800
Pixel Output Module
19

Fig. 3

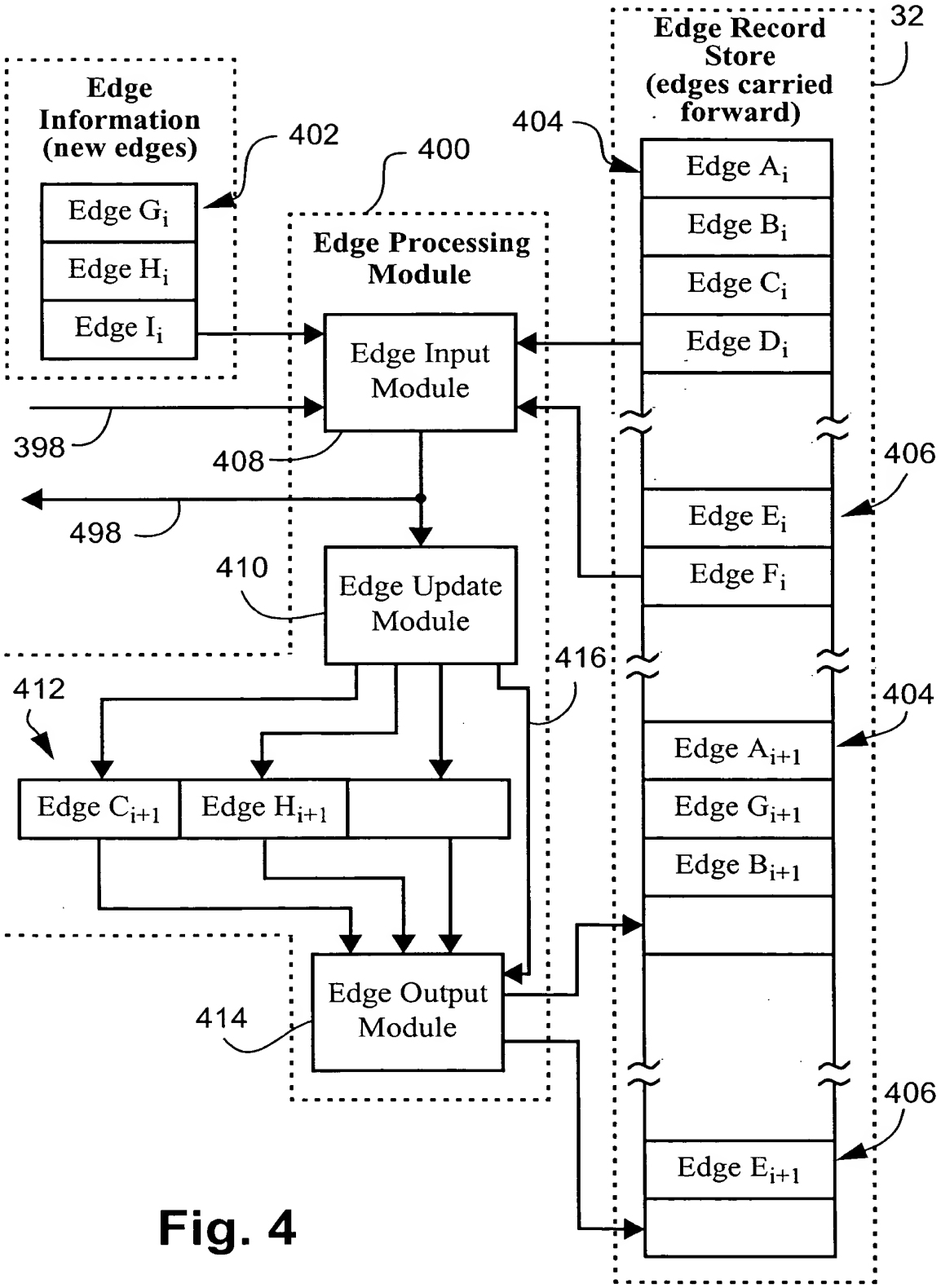

Edge Information (new edges)
Edge G_i
Edge H_i
Edge I_i
402
400
Edge Processing Module
Edge Input Module
398
408
498
410
Edge Update Module
412
Edge C_{i+1}
Edge H_{i+1}
414
Edge Output Module
416
Edge Record Store (edges carried forward)
32
404
Edge A_i
Edge B_i
Edge C_i
Edge D_i
406
Edge E_i
Edge F_i
404
Edge A_{i+1}
Edge G_{i+1}
Edge B_{i+1}
406
Edge E_{i+1}

Fig. 4

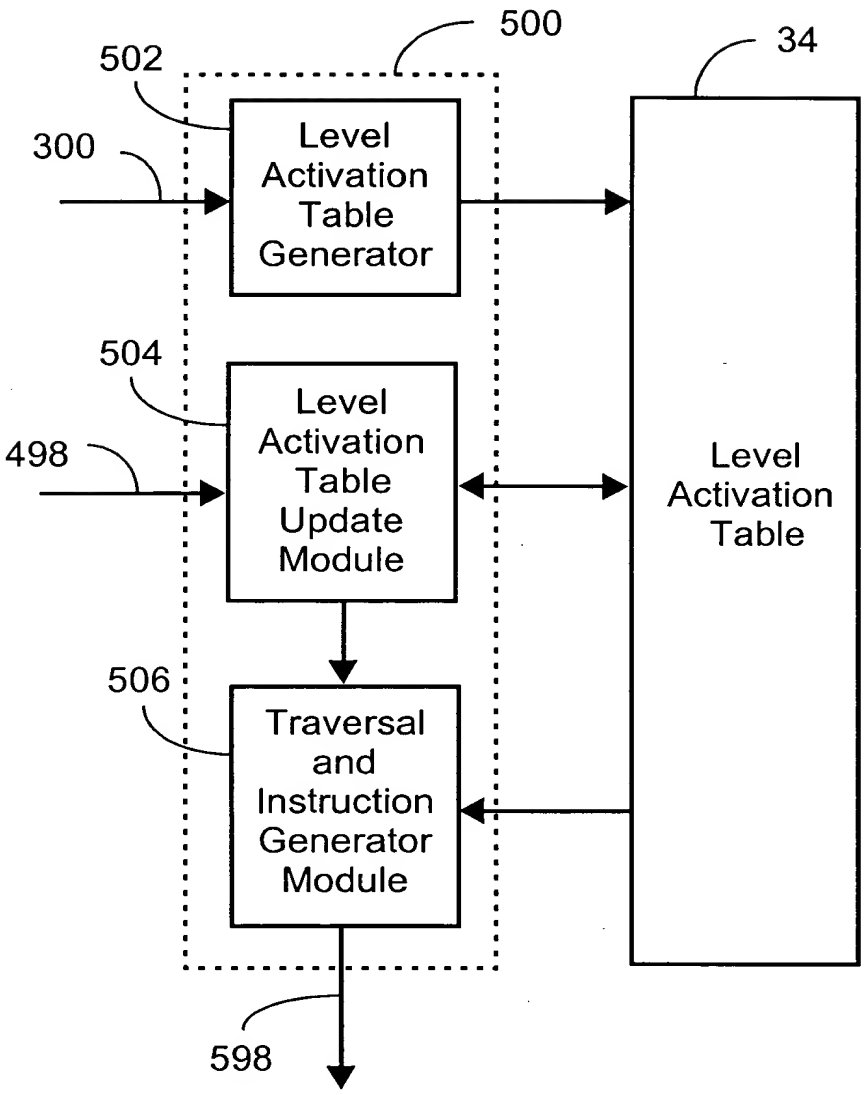

500
502
34
300
Level Activation Table Generator
504
498
Level Activation Table Update Module
Level Activation Table
506
Traversal and Instruction Generator Module
598

Fig. 5

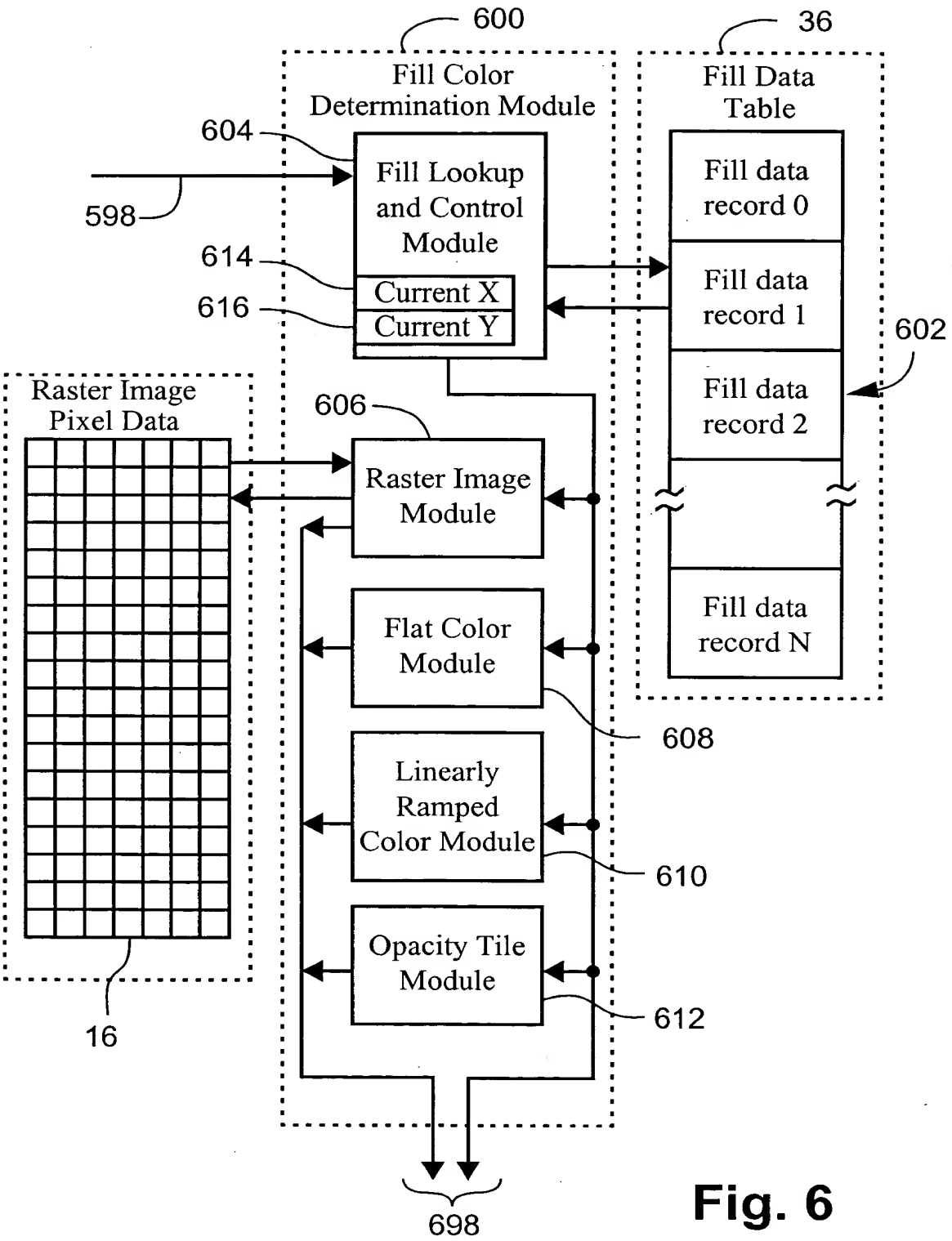

600
Fill Color Determination Module
36
Fill Data Table
604
598
Fill Lookup and Control Module
614
Current X
616
Current Y
Fill data record 0
Fill data record 1
Fill data record 2
Fill data record N
602
Raster Image Pixel Data
606
Raster Image Module
Flat Color Module
608
Linearly Ramped Color Module
610
Opacity Tile Module
612
16
698

Fig. 6

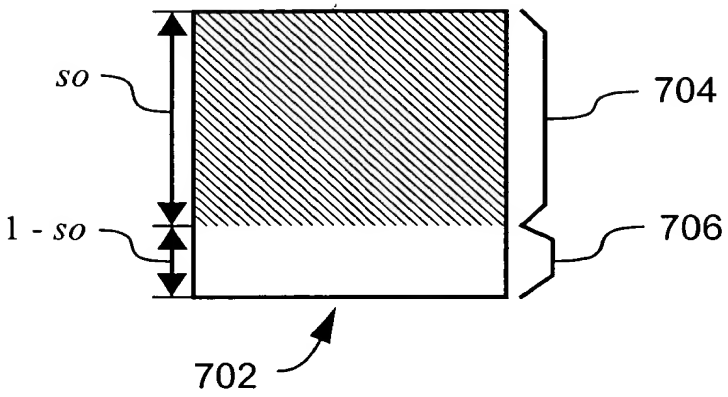


Fig. 7A

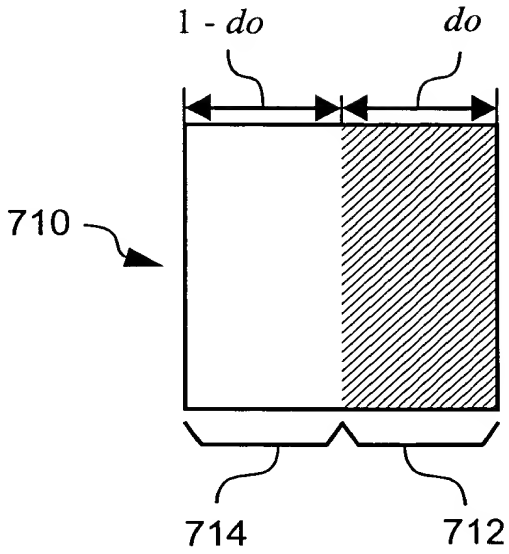


Fig. 7B

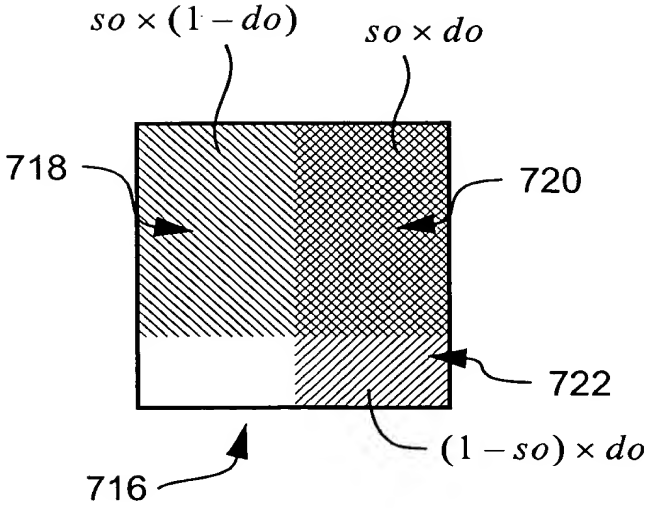


Fig. 7C

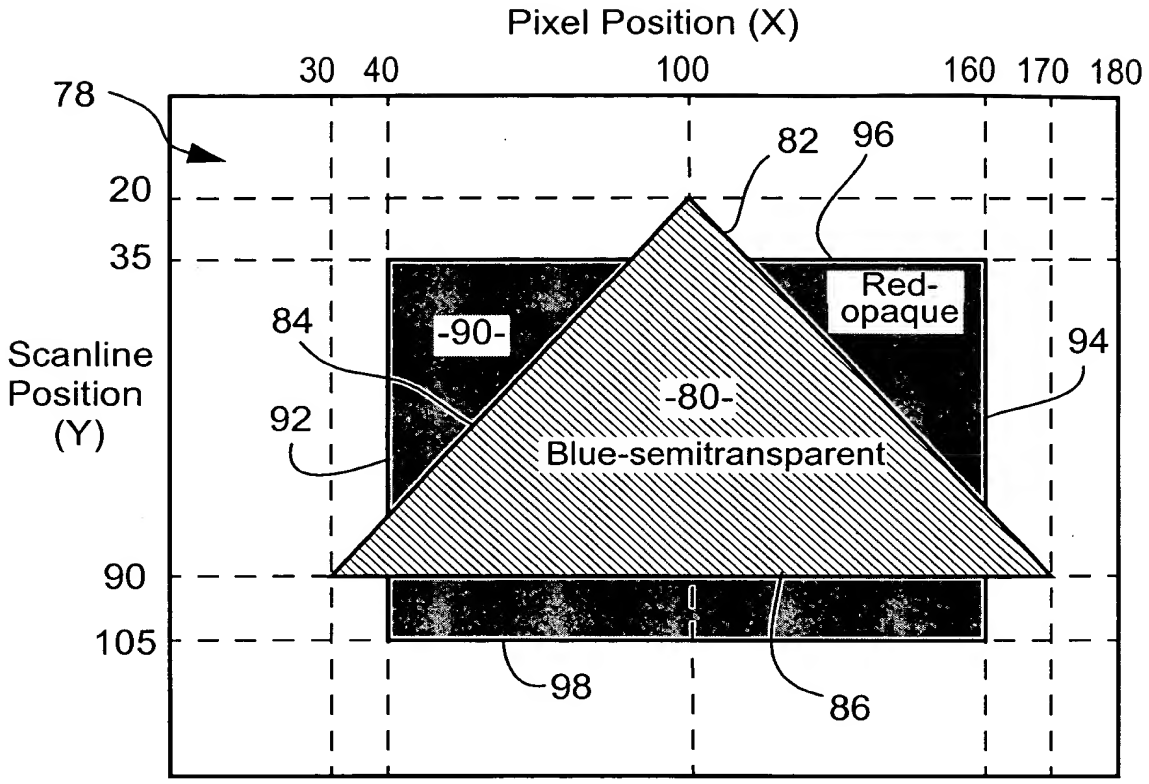


Fig. 8

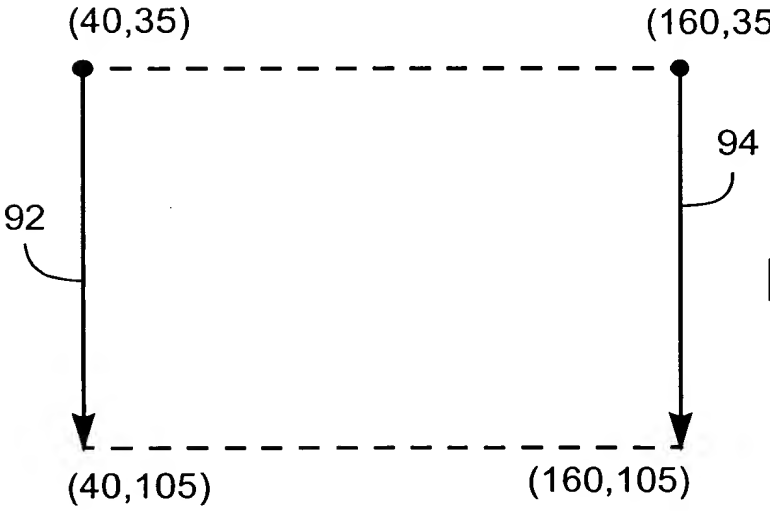


Fig. 9A

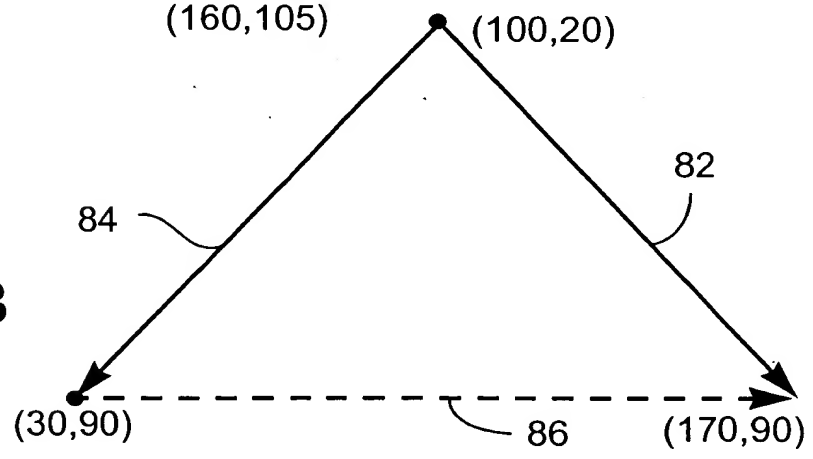


Fig. 9B

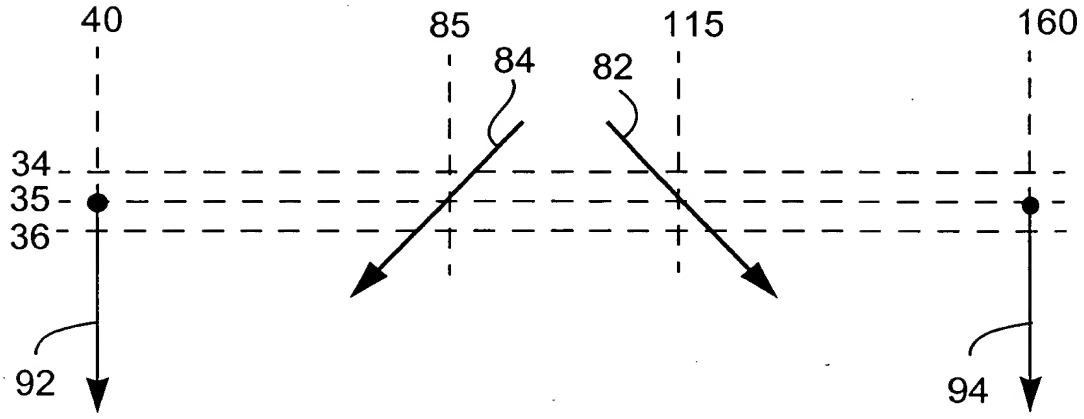

40
85
84
115
82
160
34
35
36
92
94

Fig. 10

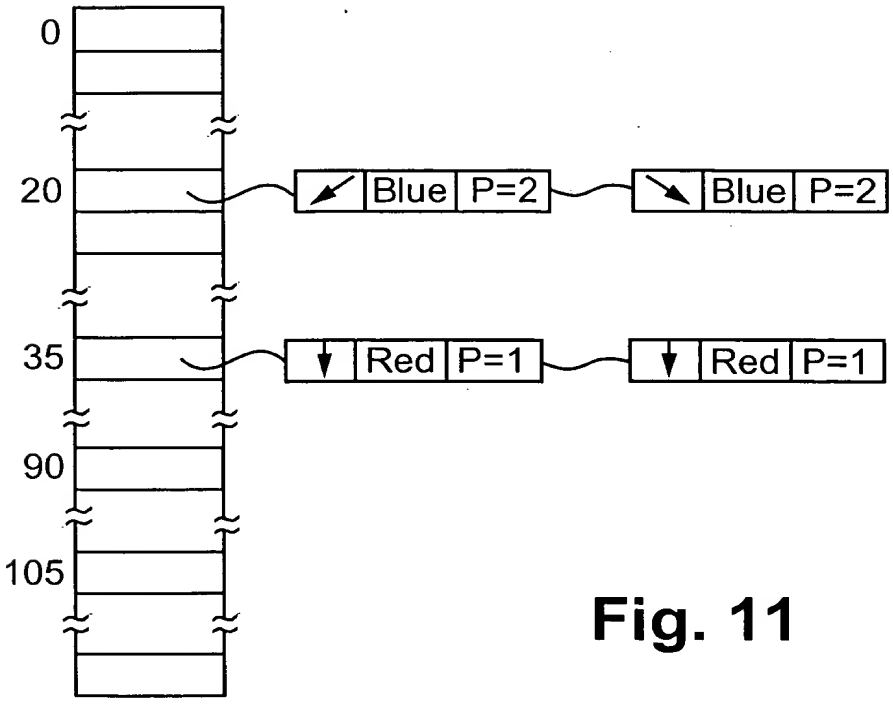

0
20
Blue
P=2
Blue
P=2
35
Red
P=1
Red
P=1
90
105

Fig. 11

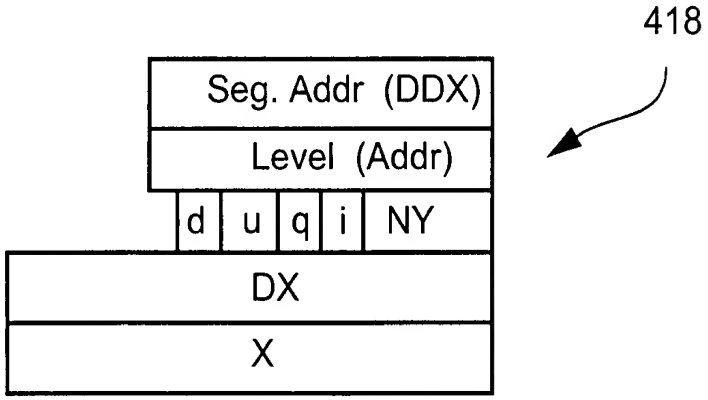


Fig. 12A

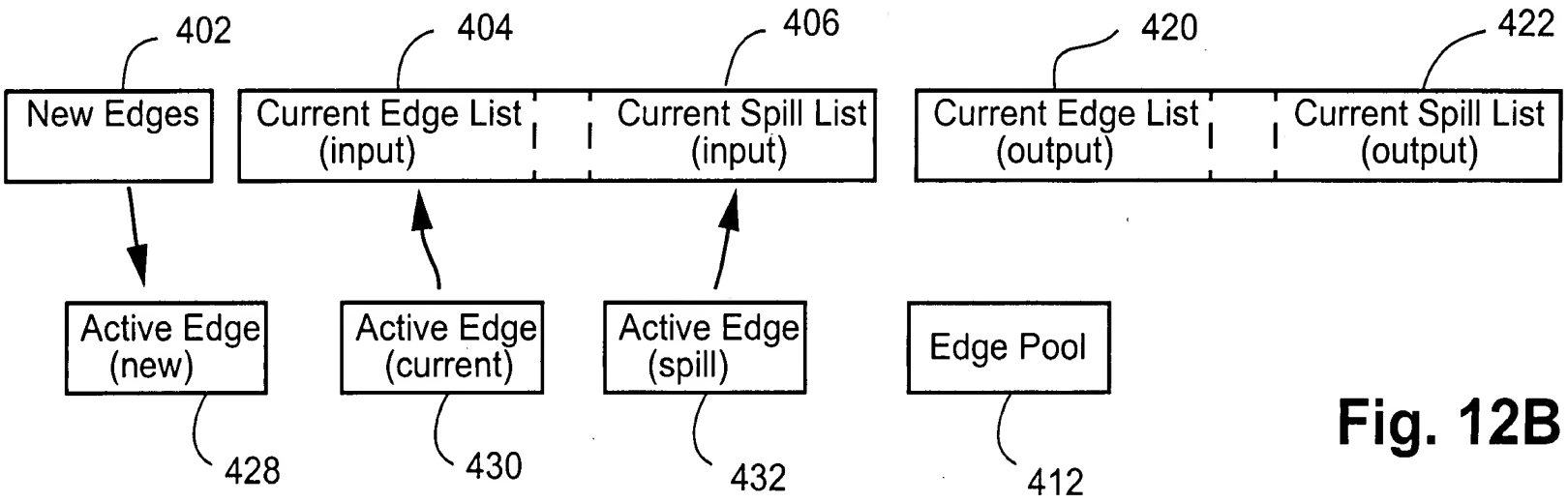


Fig. 12B

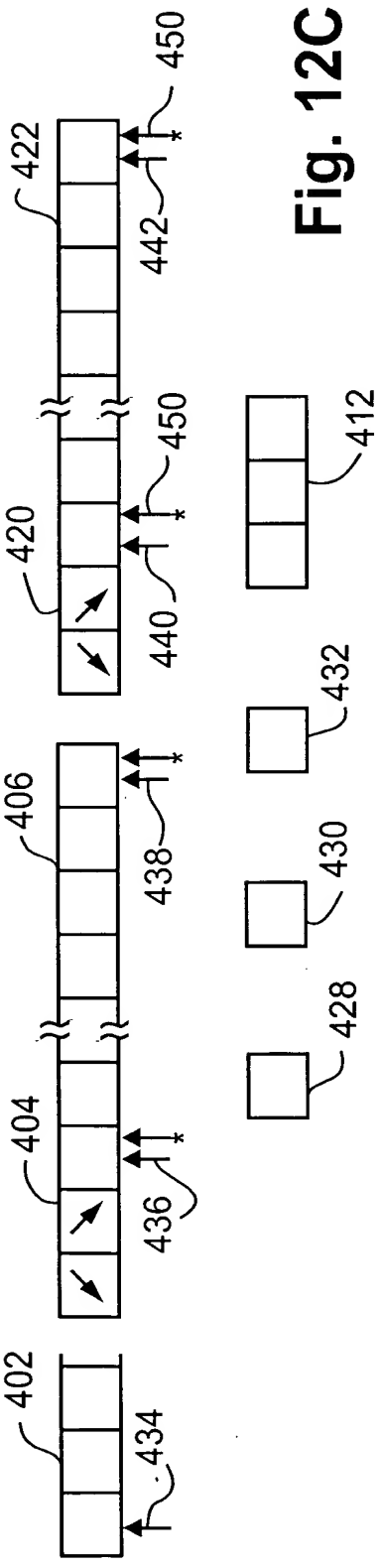


Fig. 12C

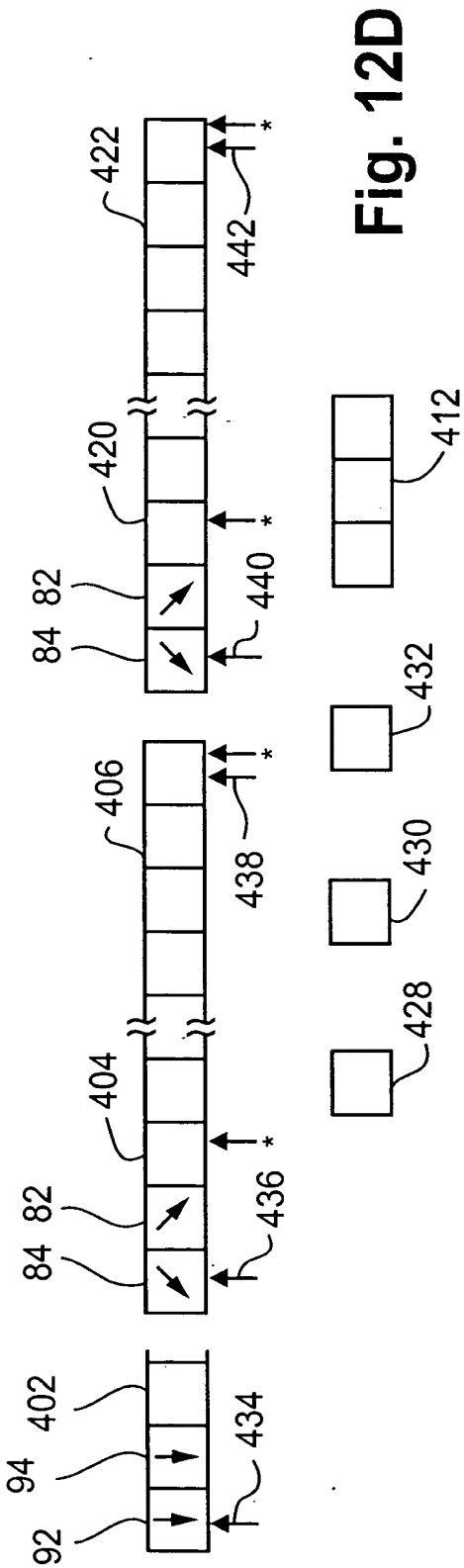


Fig. 12D

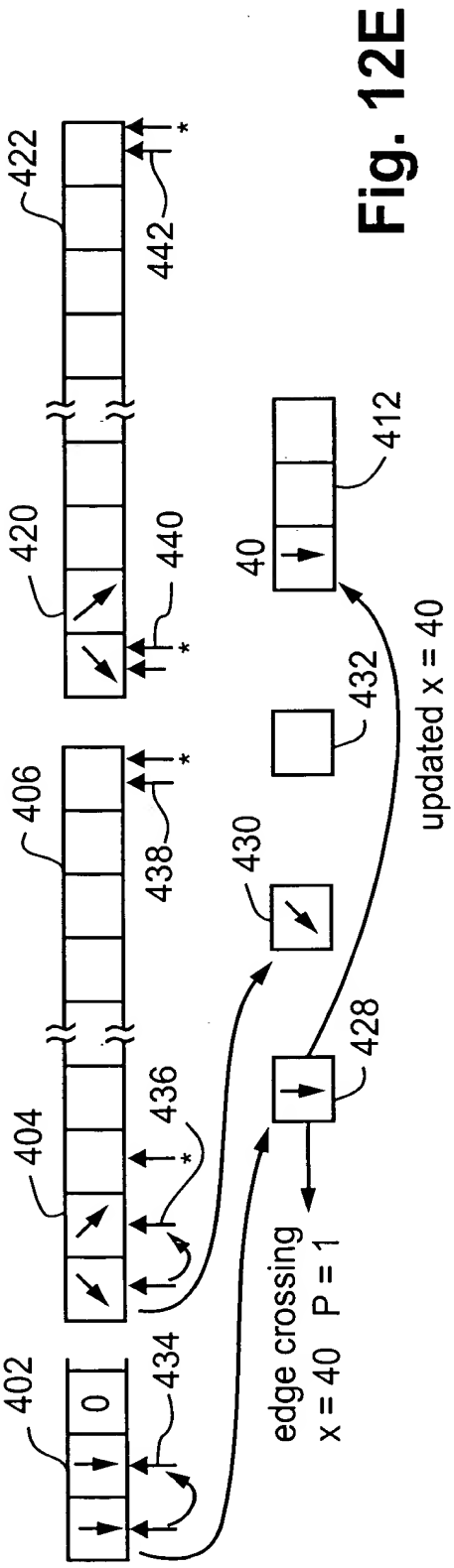


Fig. 12E

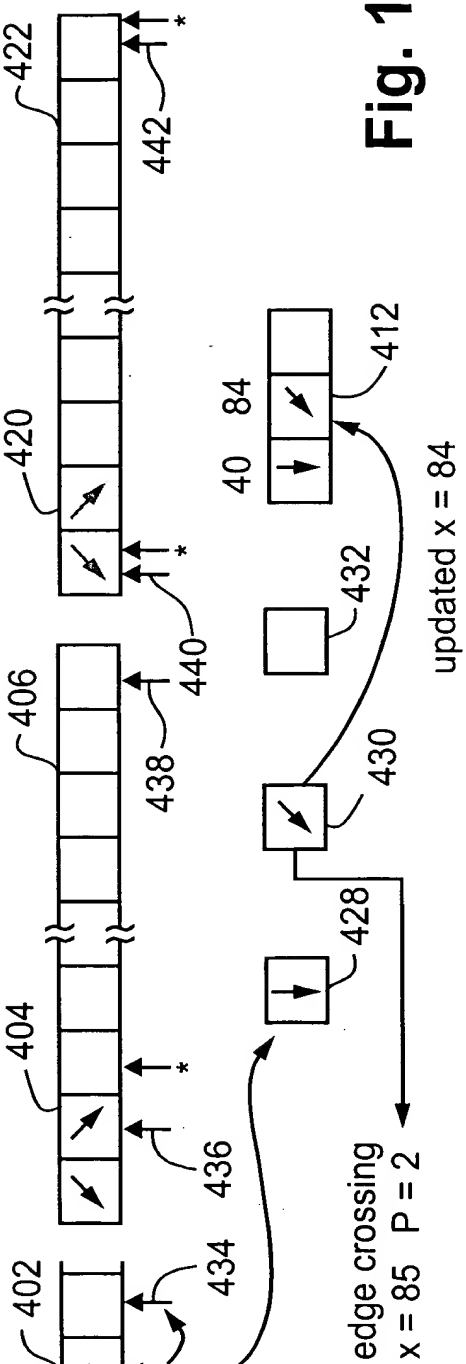


Fig. 12F

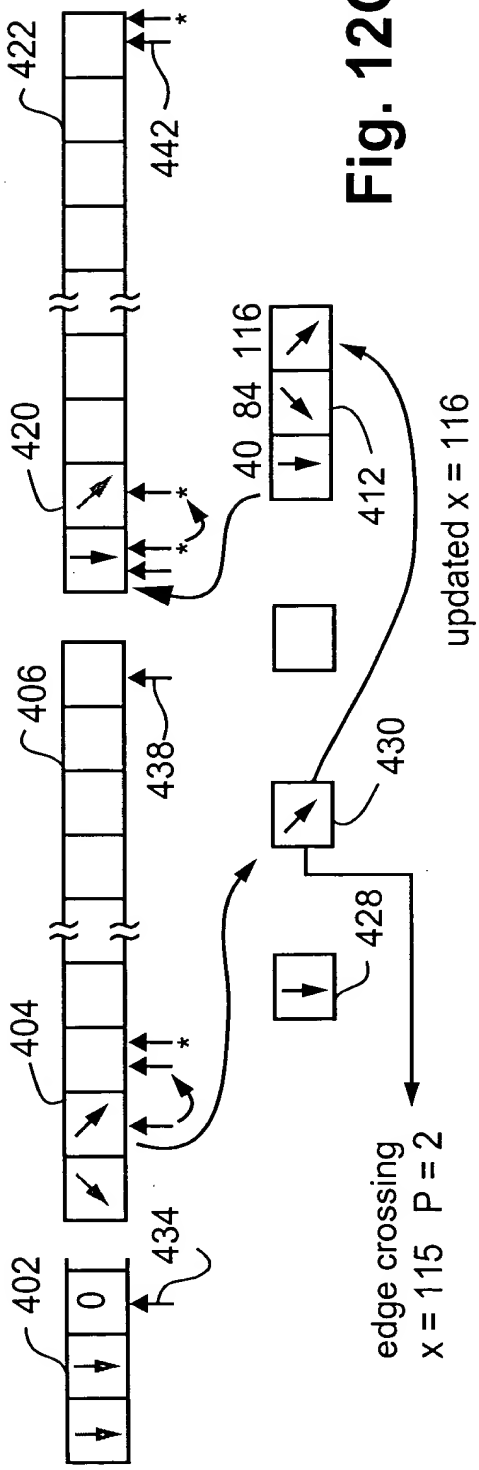


Fig. 12G

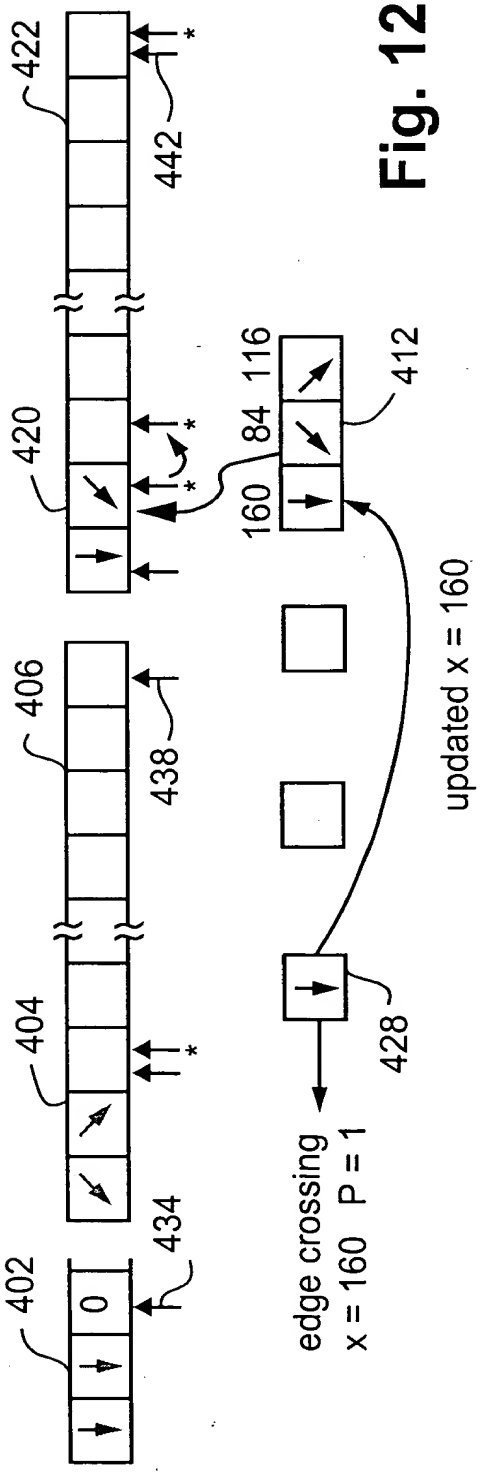


Fig. 12H

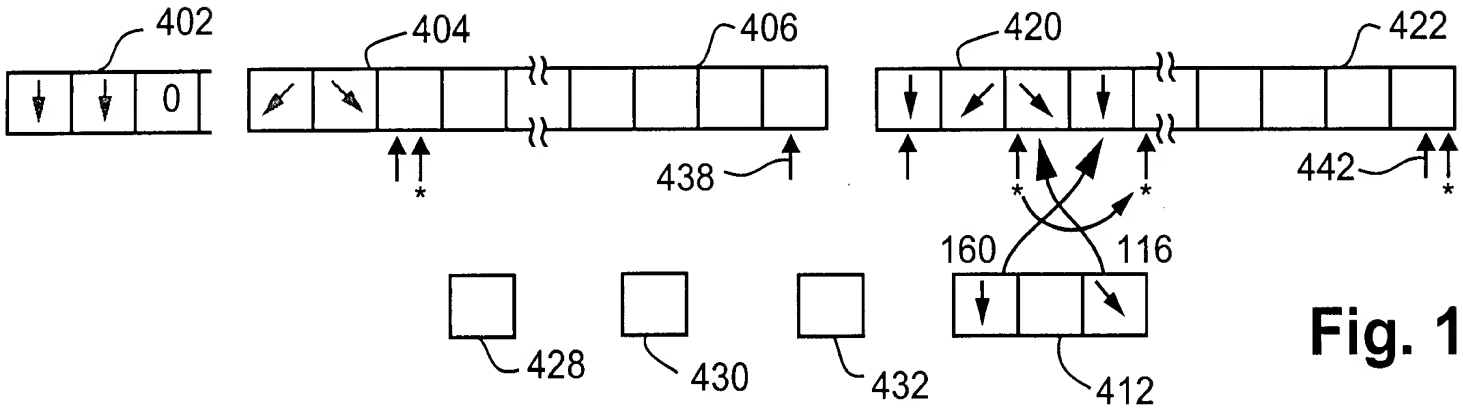


Fig. 12I

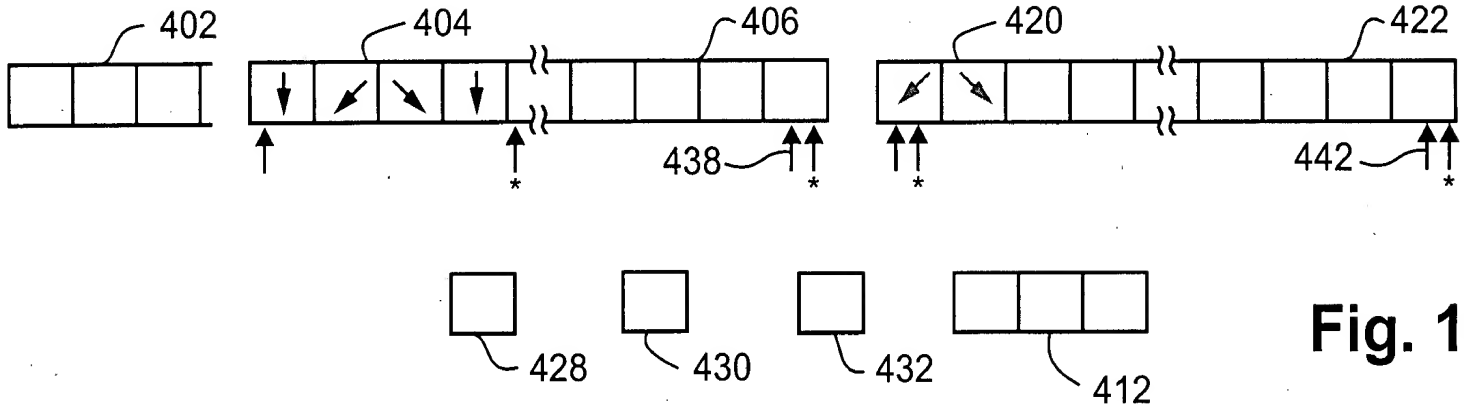


Fig. 12J

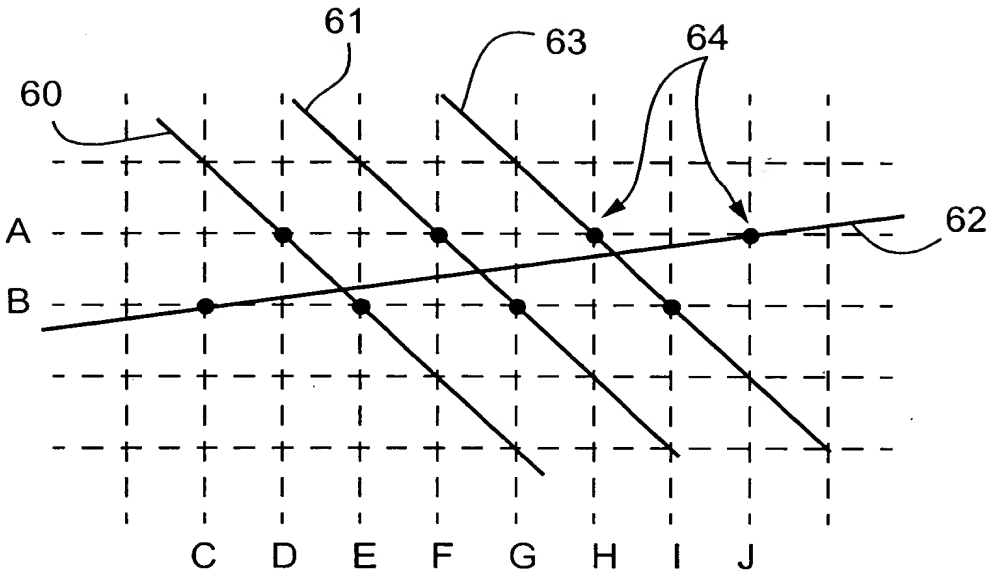


Fig. 13A

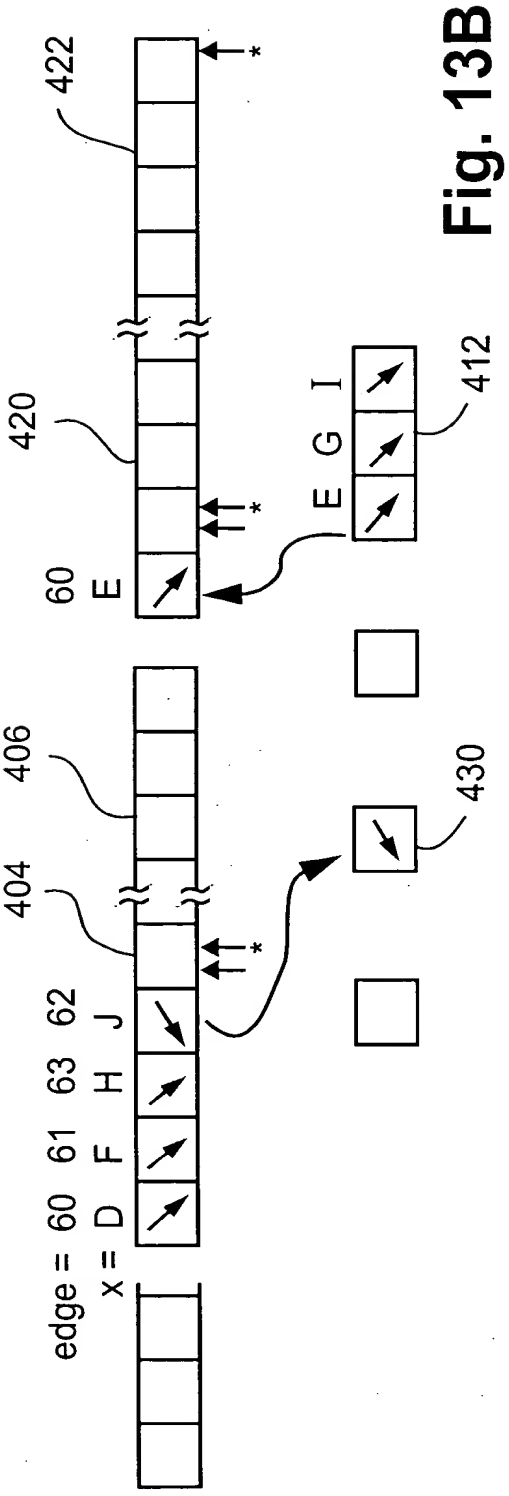


Fig. 13B

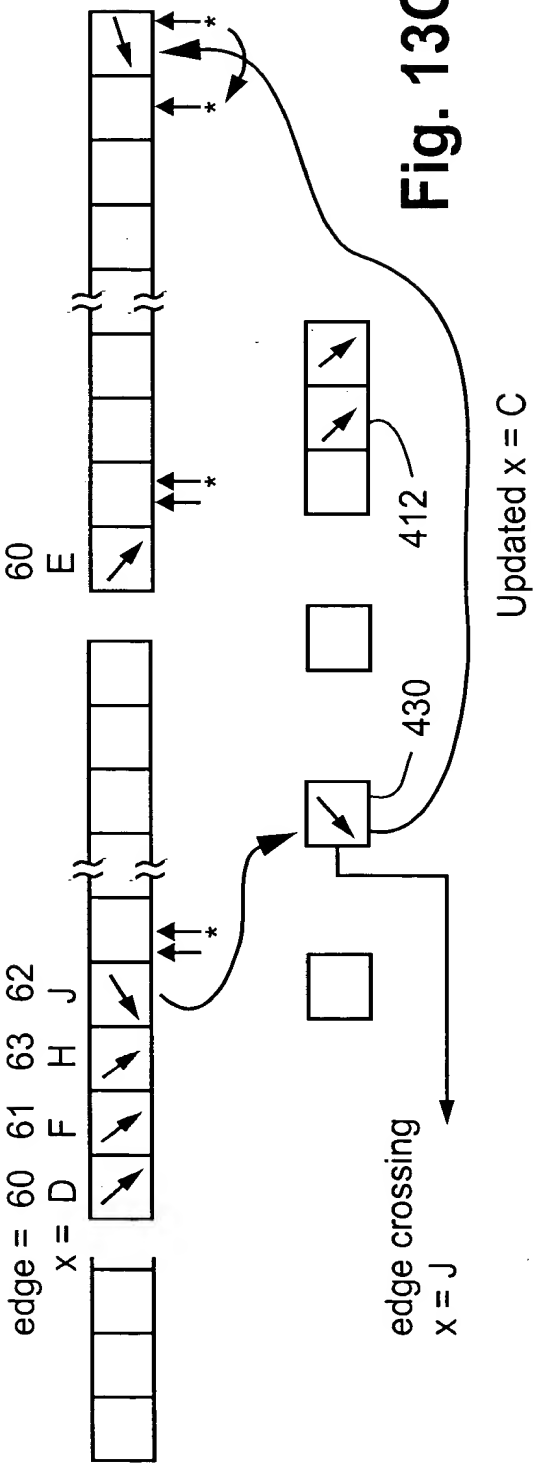


Fig. 13C

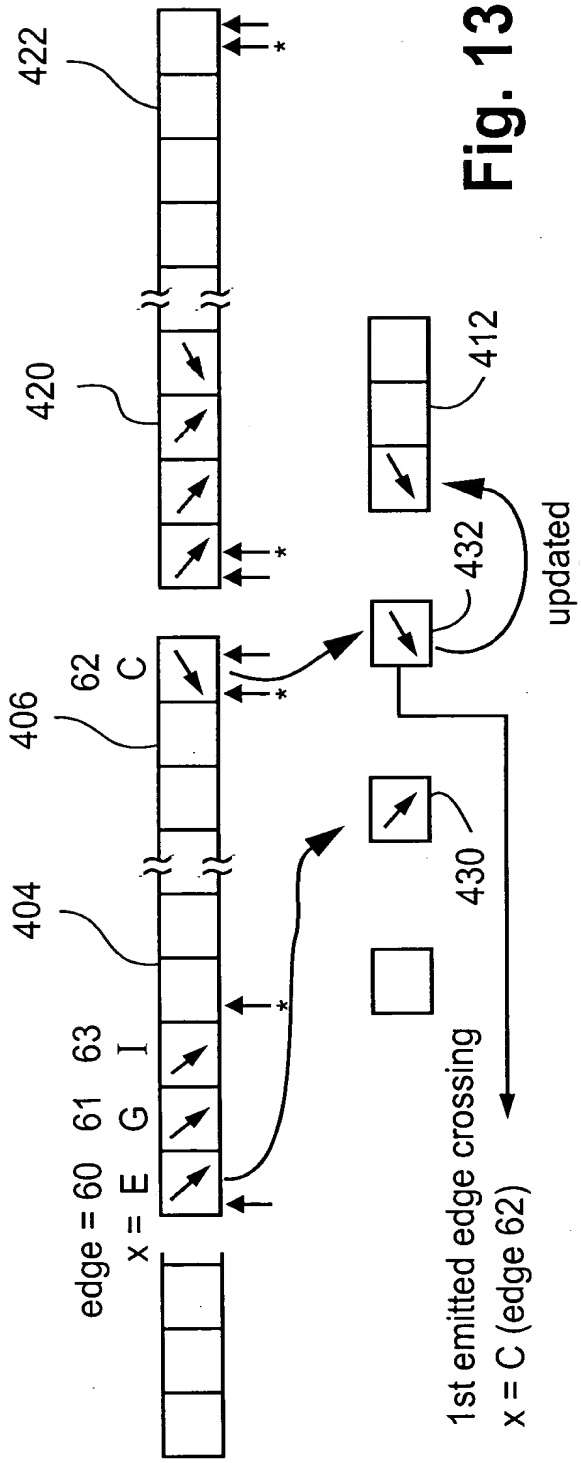


Fig. 13D

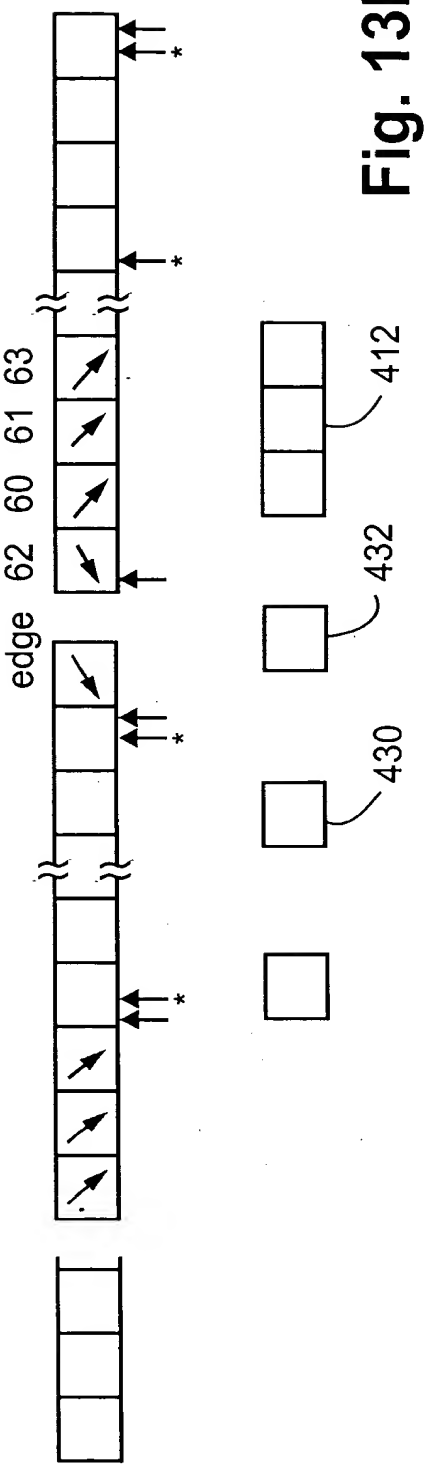


Fig. 13E

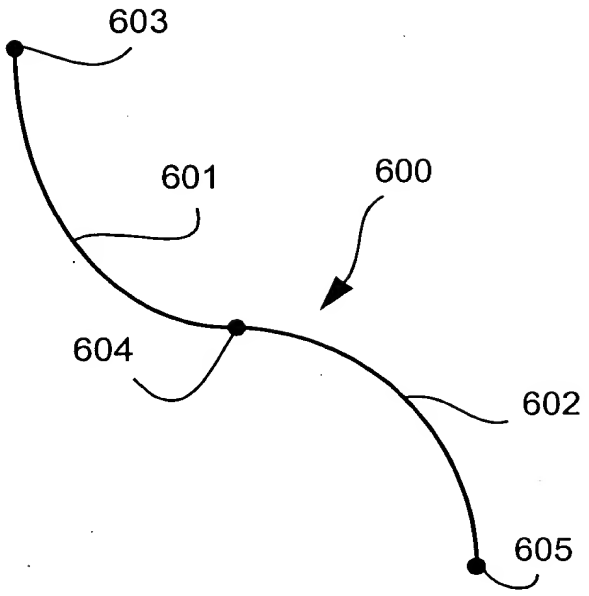


Fig. 14A
(Prior Art)

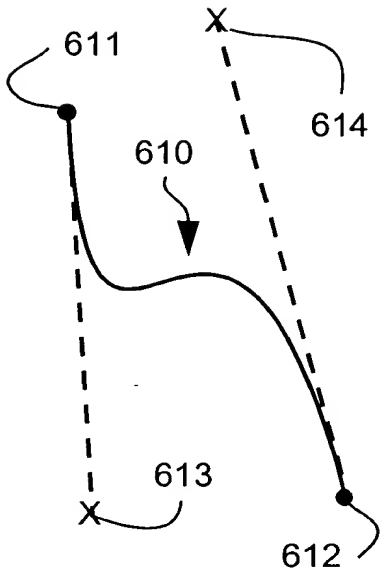


Fig. 14B
(Prior Art)

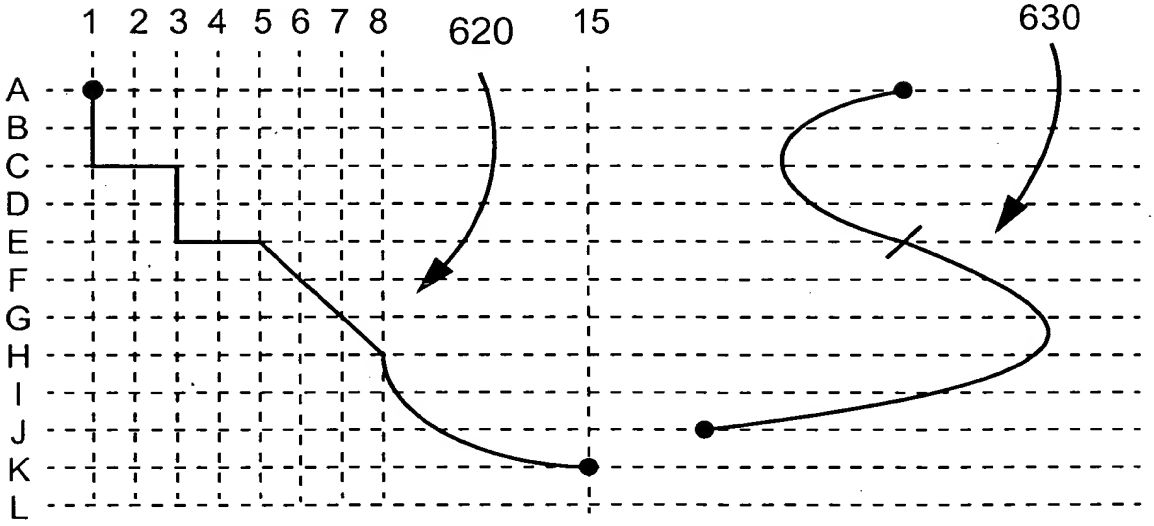


Fig. 14C

Fig. 14D

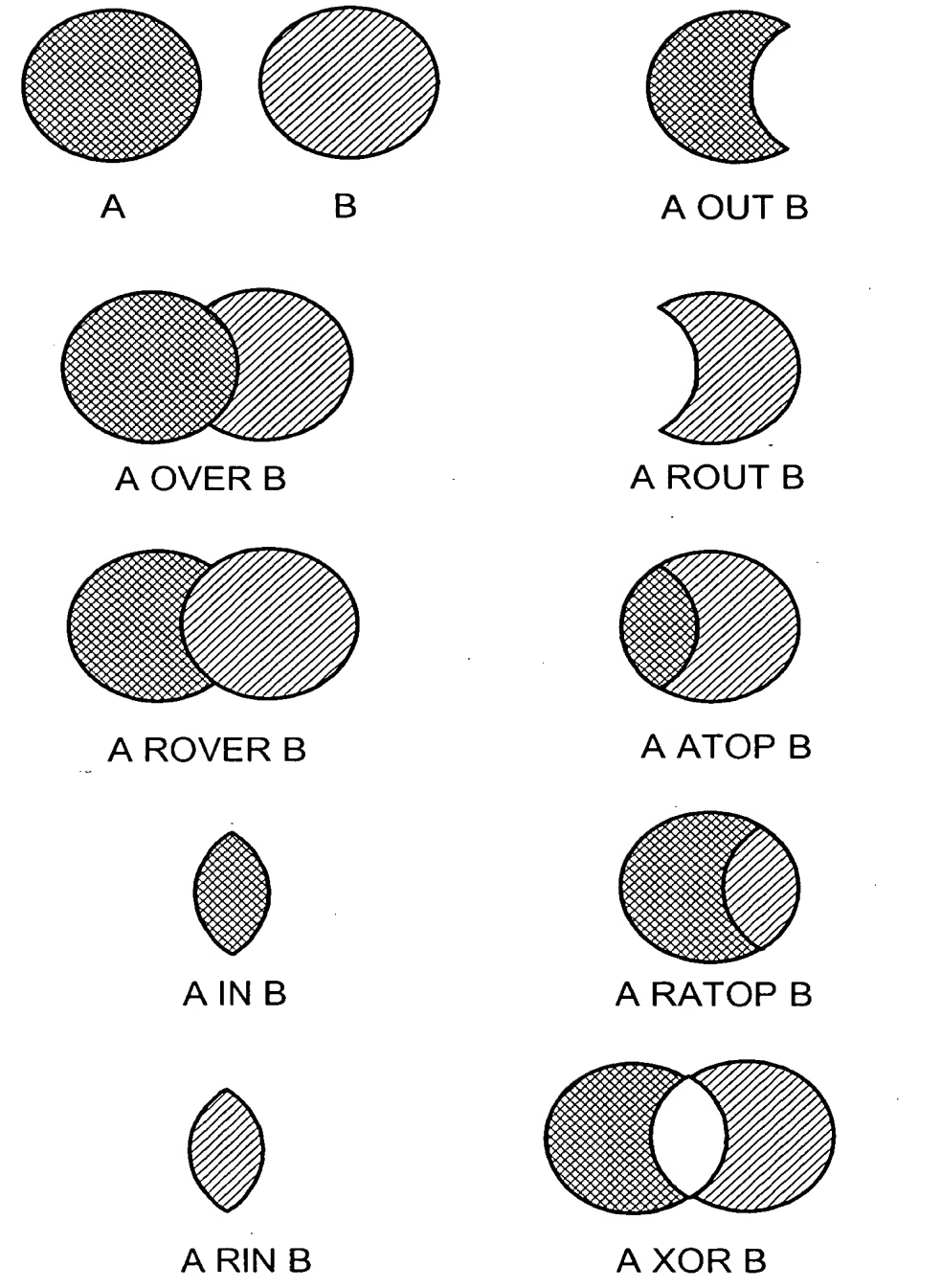

A
B
A OUT B
A OVER B
A ROUT B
A ROVER B
A ATOP B
A IN B
A RATOP B
A RIN B
A XOR B

Fig. 15

Edge 84	Edge 92
X = 100	X = 40
NY = 70	NY = 70
DX = 1	DX = 0
DDX = 0	DDX = 0
P = 1	P = 0
DIR = (-)	DIR = (+)
ADD = (irrelevant in this example)	ADD = (irrelevant in this example)

Fig. 16

Raster operation code	Operation	Comment
0x00	r = 0	BLACKNESS
0x01	r = src & dest	SRCAND
0x02	r = src & ~dest	SRCERASE
0x03	r = src	SRCCOPY
0x04	r = ~src & dest	
0x05	r = dest	NOP
0x06	r = src ^ dest	SRCINVERT
0x07	r = src | dest	SRCPAINT
0x08	r = ~(src | dest)	NOTSRCERASE
0x09	r = ~(src ^ dest)	
0x0a	r = ~dest	DSTINVERT
0x0b	r = src | ~dest	
0x0c	r = ~src	NOTSRCCOPY
0x0d	r = ~src | dest	MERGEPAINT
0x0e	r = ~(src & dest)	
0x0f	r = 0xff	WHITENESS
0x10	r = min(src, dest)	
0x11	r = max(src, dest)	
0x12	r = clamp(src + dest)	
0x13	r = src	
0x14	r = clamp(src - dest)	
0x15	r = dest	
0x16	r = clamp(dest - src)	
0x17	r = clamp(src + dest) where dest is signed	
0x18	r = threshold (dest, src)	
0x19	r = threshold (src, dest)	
0x1a	r = ~ dest	
0x1b	o = luminance (dest, src)	
0x1c	r = ~src	
0x1d	o = ckey(dest; src +/- o)	

Fig. 17

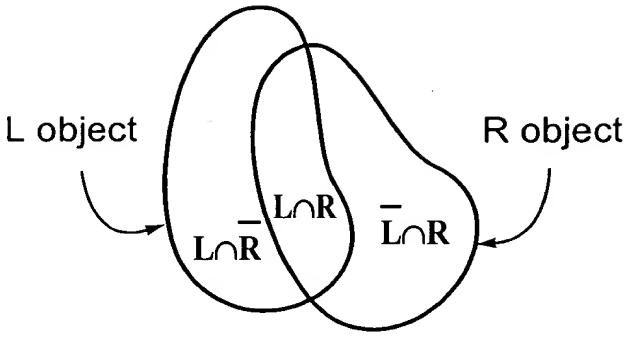


Fig. 18A

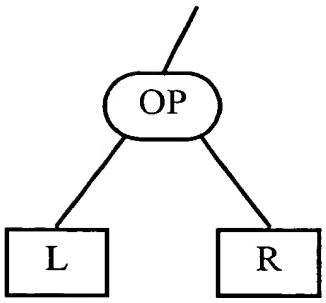


Fig. 18B

Fig. 19

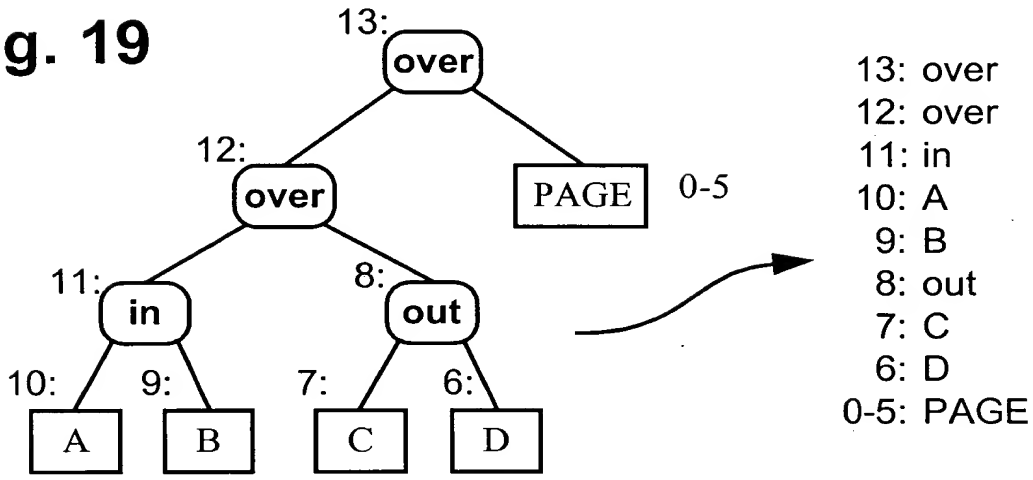
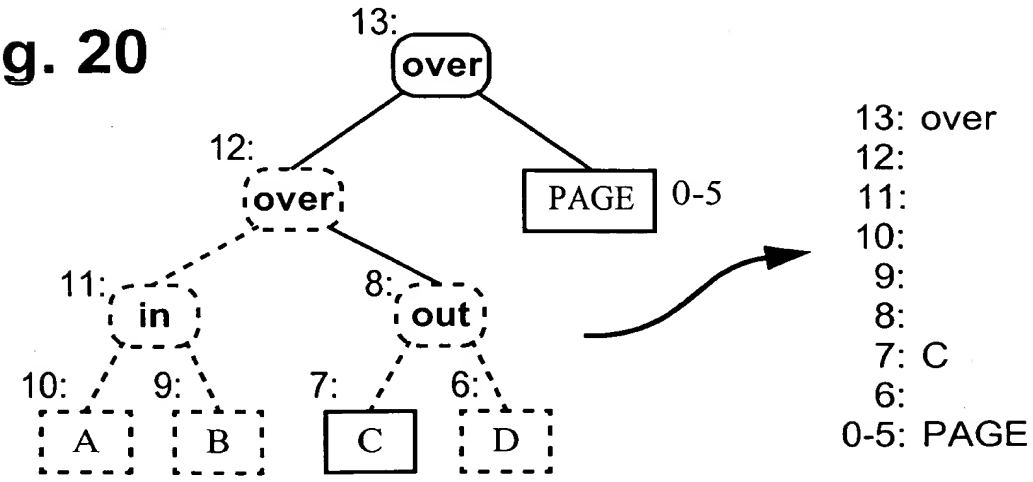


Fig. 20



Index	L Active	R Active	L∩$\overline{R}$ reqd	$\overline{L}$∩R reqd	Leaf/ Operator Entry	Node Active	Parent	Node is L	Generate L	Generate R	L∩R op used	R Branch Index
13	0	1	1	1	over	1	?	0	0	1	0	5
12	0	0	1	1	over	0	13	1	0	0	0	8
11	0	0	0	0	in	0	12	1	0	0	0	9
10					leaf A	0	11	1				
9					leaf B	0	11	0				
8	0	0	1	0	out	0	12	0	0	0	0	6
7					leaf C	0	8	1				
6					leaf D	0	8	0				
PAGE												

Fig. 21

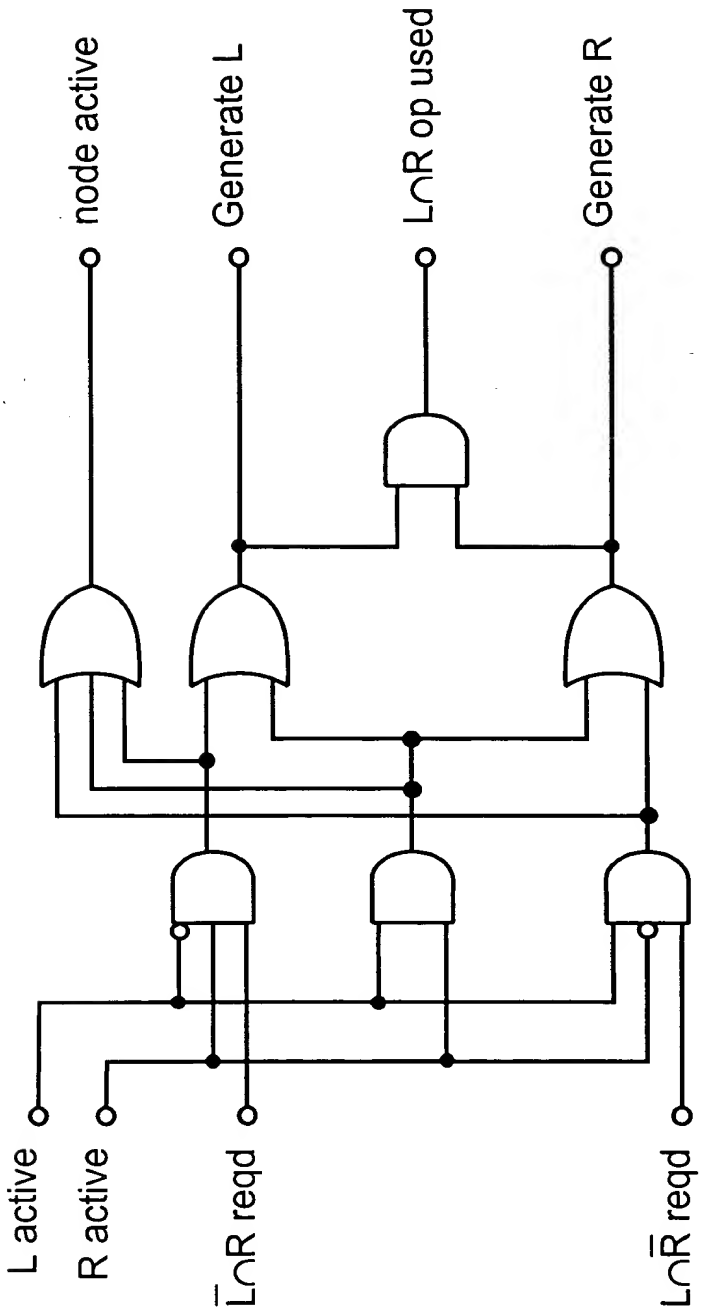

node active
Generate L
L∩R op used
Generate R
L active
R active
L∩R reqd
L∩R̄ reqd

Fig. 22

Index	L Active	R Active	L∩$\bar{R}$ reqd	$\bar{L}$∩R reqd	Leaf/ Operator Entry	Node Active	Parent	Node is L	Generate L	Generate R	L∩R op used	R Branch Index
13	1	1	1	1	over	1	?	0	1	1	1	5
12	0	1	1	1	over	1	13	1	0	1	0	8
11	0	0	0	0	in	0	12	1	0	0	0	9
10					leaf A	0	11	1				
9					leaf B	0	11	0				
8	1	0	1	0	out	1	12	0	1	0	0	6
7					leaf C	1	8	1				
6					leaf R	0	8	0				
PAGE												

Fig. 23

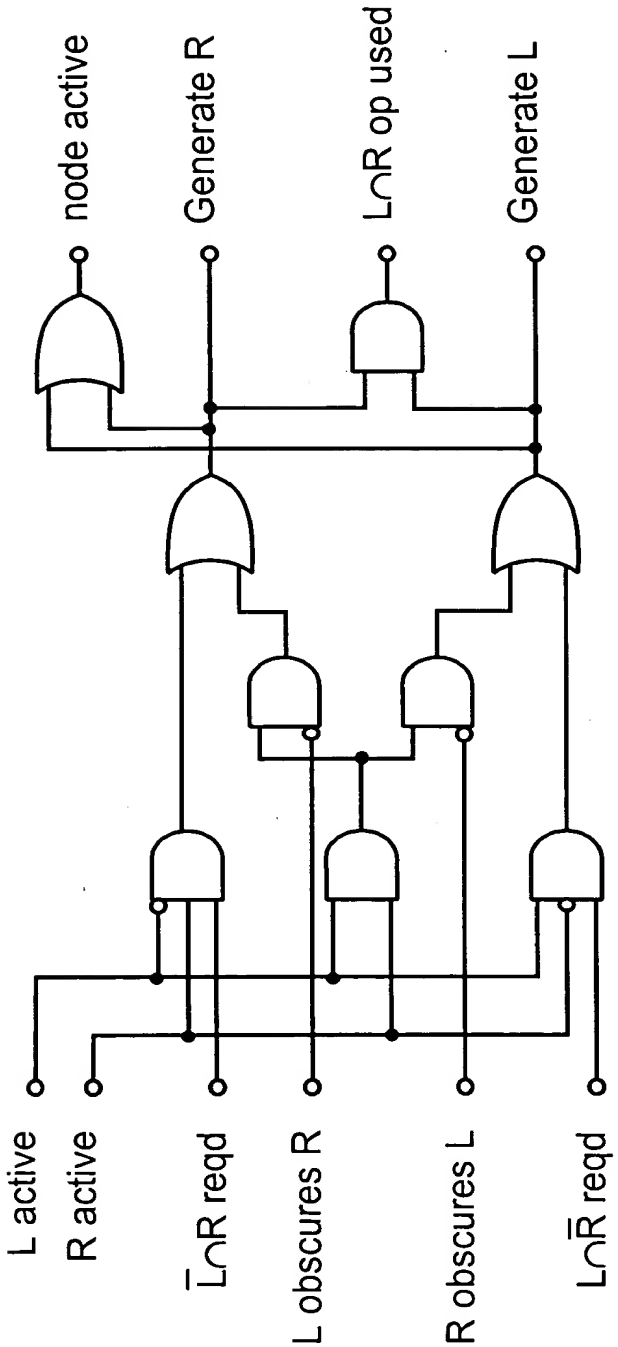

node active
Generate R
L∩R op used
Generate L
L active
R active
$\bar{L}$∩R reqd
L obscures R
R obscures L
L∩$\bar{R}$ reqd

Fig. 24

PCT/GB98/03650

Index	L Active	R Active	$L \cap \overline{R}$ reqd	$\overline{L} \cap R$ reqd	L obscures R	R obscures L	Leaf/ Operator Entry	Node Active	Parent	Node is L	Gene-rate L	Gene-rate R	L∩R op used	R Branch Index
			0	0	0	0	in							
			0	0	1	0	(CLIP IN)							
			1	0	0	0	out							
			1	0	1	1	(CLIP OUT							

Fig. 25

L	T	T	T	L	L	L	O	O	O
R	T	R	O	T	R	O	T	R	O
Generate L	0	0	0	0	1	1	0	1	1
Generate R	0	0	0	0	0	0	0	0	0
Result	T	T	T	T	L	L	T	O	O

Fig. 26

L	T	T	T	L	L	L	O	O	O
R	T	R	O	T	R	O	T	R	O
Generate L	0	0	0	0	1	1	0	1	1
Generate R	0	0	0	0	1	1	0	1	1
Result	T	T	T	T	LR	L	T	R	O

Fig. 27

L	T	T	T	L	L	L	O	O	O
R	T	R	O	T	R	O	T	R	O
Generate L	0	0	0	1	1	1	1	1	1
Generate R	0	0	0	0	1	1	0	1	1
Result	T	T	T	L	L(1-R)	T	O	(1-R)	T

Fig. 28

L	T	T	T	L	L	L	O	O	O
R	T	R	O	T	R	O	T	R	O
Generate L	0	0	0	1	0	0	1	0	0
Generate R	0	0	0	0	0	0	0	0	0
Result	T	T	T	L	T	T	O	T	T

Fig. 29

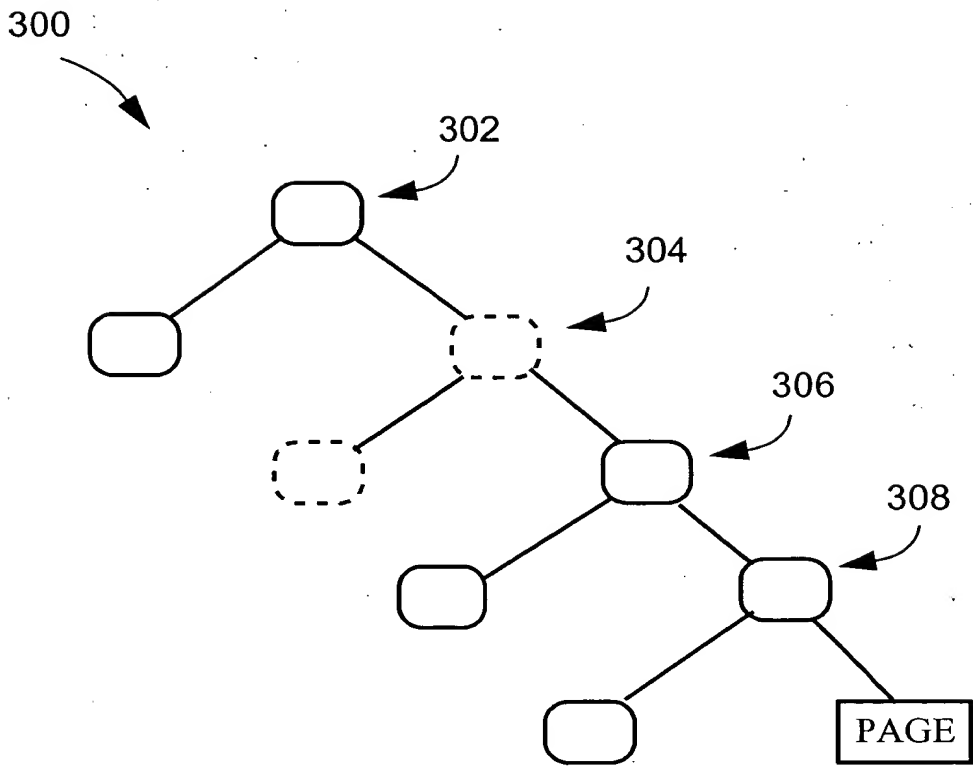


Fig. 30